

THREE NEW SPECIES OF *OCTOPUS* (MOLLUSCA: CEPHALOPODA) FROM SOUTH-EASTERN AUSTRALIA

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Abstract

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Three new species of *Octopus* are described and illustrated from south-eastern Australian waters: *Octopus warringa*, *Octopus kauria* and *Octopus bunurong*. *Octopus warringa* also occurs in New Zealand.

Introduction

There are about 30 species of octopus described from Australian waters (Lu and Phillips, 1985). As part of an ongoing study of the fauna, a systematic revision of the inshore benthic octopods of south-eastern Australia was undertaken (Stranks, 1988), and three undescribed species of *Octopus* were identified. This paper describes the new species. More details will be included with the future publication of a larger monographic revision of the Octopodidae of south-eastern Australia.

The counts, measurements and indices listed are as defined by Roper and Voss (1983). Other abbreviations used are ML — mantle length and TL — total length. Material is lodged in the Australian Museum, Sydney (AM); Museum of Victoria, Melbourne (NMV); Otago Museum, Dunedin (OM); and South Australian Museum, Adelaide (SAM).

Octopodidae

Octopus Lamarck, 1798

Type species. Octopus vulgaris Lamarck, 1798.

Diagnosis. Benthic octopodids. Mantle saccular, without fins. Eight arms lacking cirri, arms with biserial suckers, third right arm of males hectocotylied with end of arm modified into ligula and calamus. Web well developed. Ink sac present. Mantle aperture wide. Internal shell cartilaginous and vestigial.

Octopus warringa sp. nov.

Figures 1a-f

Polypus duplex.—Berry, 1917: 11, text fig. 5 (non *Octopus duplex* Hoyle, 1885).

Robsonella australis.—Benham, 1942: 227, text fig. 3, pls 18, 19 (*partim*).—Dell, 1952: 32, pl. 4, figs 2-6, pl. 5, figs 1, 3, 4, pls 7, 8 (*partim*).—1959: 95 (non *Octopus australis* Hoyle, 1885).

Octopus Species A.—Stranks, 1988: 54, text figs 21-25.

Material examined. Holotype: Tasmania, Maria Island, west of Darlington (42°35'S, 148°03'E), 30 m, R. Wilson, 23 Apr 1985, NMV F57444 (mature male, 16.5 mm ML).

Paratypes: Tasmania. Off east coast of Tasmania (42°40'S, 148°28'E), 122 m, RV "Discovery", Station 113, BANZARE, 23 Mar 1931, SAM D15219 (submature female, 22.0 mm ML); Maria Island (42°44'S, 148°01'E), D. Clayton, 1985, NMV F53219 (submature female, 25.9 mm ML; 2 mature males, 16.0 mm ML and 18.0 mm ML).

Victoria, eastern Bass Strait (38°10'S, 147°49'E), 48 m, Station 262, East Gippsland Scallop Survey, 28 Feb 1971, NMV F31259 (mature male, 14.4 mm ML)

New Zealand, Portobello (45°51'S, 170°39'E), C. Hedley, 10 Dec 1918, AM C159292 (mature male, 20.5 mm ML).

Other material: Tasmania. Off east coast of Tasmania (42°40'S, 148°28'E), from fish stomach contents, RV "Discovery", stn 113, BANZARE, 23 Mar 1931, SAM D15220 (male, 18.9 mm ML); off Maria Island (42°38'S, 148°05'E), 119 m, RV "Aurora", Australasian Antarctic Expedition, 12 Dec 1912, AM C40887 (mature female, 29.6 mm ML).

Victoria, eastern Bass Strait (37°55'S, 148°21'E), 50 m, stn 412, East Gippsland Scallop Survey, 15 Feb 1971, NMV F53214 (immature male, 12.4 mm ML).

New Zealand. Foveaux Strait (46°32'S, 168°00'E), OM A.15.34 (mature female, 26.5 mm ML, with eggs); same locality, OM A.29.111 (mature male, 34.1 mm ML; 2 submature females, 12.9 mm ML and 22.5 mm ML); Portobello (45°51'S, 170°39'E), OM A.28.24 (2 mature males, 19.1 mm ML and 20.6 mm ML; 2 submature females, 16.2 mm ML & 20.6 mm

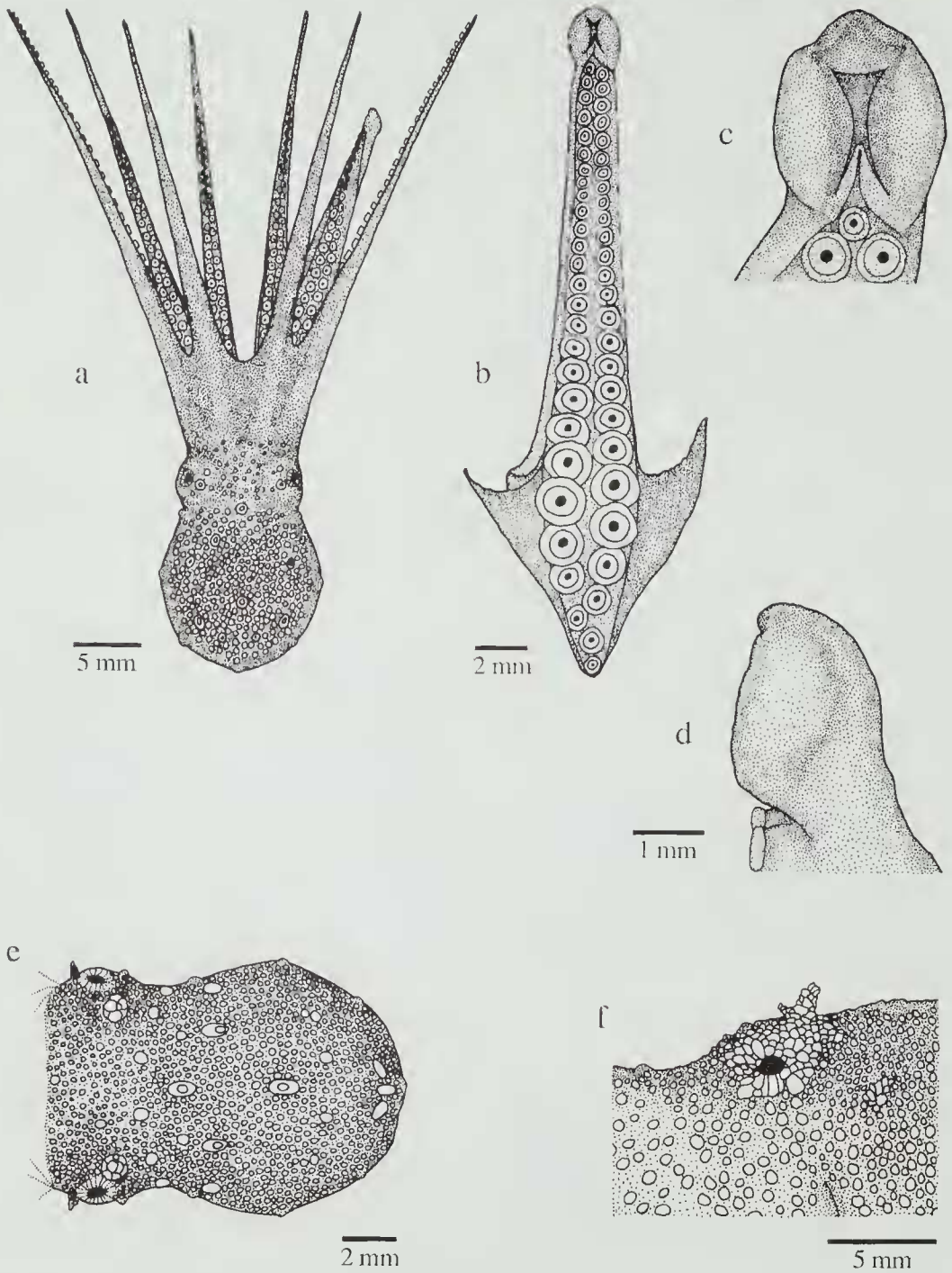


Figure 1. *Octopus warringa* sp. nov.: a, dorsal view of holotype, NMV F57444, male, 16.5 mm ML; b, hectocotyliised arm, and c, dorsal, and d, lateral, detail of hectocotylus, of paratype, NMV F53219, 16.0 mm ML; e, tubercles, branched and unbranched papillae on head and mantle dorsum of NMV F53214, male, 12.4 mm ML; f, lateral view of arborescent ocular papillae of paratype, NMV F53219, male, 16.0 mm ML.

ML); between Nelson and Stephen Islands, Tasman Bay (41°42'S, 174°00'E), 18–55 m, G. Thomson, 1900, OM A.0.97 (submature female, 24.8 mm ML).

Description. Small animals (ML to 35 mm; TL to 125 mm); mantle broadly ovoid (MWI 56.3–80.5–107.0); head wide, but narrower than mantle (HWI 40.9–66.0–82.2), demarked from mantle by moderate constriction; eyes large, projecting above surface of head. Funnel large, stout, bluntly tapered (FuLI 32.6–41.7–56.7); funnel organ W-shaped, limbs thick, outer limbs three-quarters as long as median limbs. Arms long (MAI 27.4–36.4–52.8) (1.9–3.7 times ML in mature animals), stout, tapering to narrow tips. Arm lengths subequal, arm order usually III.IV.II.I. Arm suckers biserial, raised from arm surface, moderately sized (ASIn 6.1–10.3–14.3), 6th to 10th suckers usually largest, enlarged on all arms of mature males and females. Third right arm of males hectocotylic, shorter than its opposite number (OA1 67.2–77.6–85.8; HeAI 149.2–205.5–273.3); ligula 6–10% of third right arm length in mature animals (LLI 6.3–7.9–10.2); ligula groove long, well marked and deep, without transverse ridges; calamus short, acutely pointed (CaLI 24.0–35.7–50.0); hectocotylic arm with 51–65 suckers. Web shallow (WDI 18.8–24.7–33.9), web formula usually CB=DA=E. Radula with B₃₋₄ seriation of the rhaehidian. Ink sac present. Gill lamellae 6–8. Mature female with small eggs (2–3 mm long; 1.0–1.5 mm wide), very long stalks, forming festoons. Male with very long penis (PLI 15.2–29.3–51.9), with a coiled diverticulum marked by three lobes; spermatophores very long (SpLI 71.7–146.0–184.4), slender (SpWI 2.5–3.1–3.6), with large, coiled sperm reservoir (SpRI 29.2–32.2–36.4).

Integumental sculpture consists of a pattern of fine, rounded and closely set epidermal tubercles; tubercles cover both dorsal and ventral surfaces; branched and unbranched papillae present on dorsum; pattern of papillae on mantle dorsum includes approximately seven subparallel rows of simple, usually unbranched papillae along the mantle length; each row has 3–4 papillae, a single larger papilla forms a posterior point on the mantle; a larger arborescent papilla is obvious in the supraocular region, surrounded by 3–4 smaller, usually unbranched papillae; lateral integumentary ridge or fold around mantle circumference absent. No information is available on colouring of live animals. Preserved specimens in ethyl alcohol uniformly light brown to purple dorsally, cream to light brown ventrally. Ocelli absent.

Distribution. South-eastern Australia, from the Great Australian Bight to eastern Victoria, including Bass Strait and Tasmania. Also in the temperate waters of New Zealand, including the North and South Islands, and Stewart Island. An inshore species, living on rocky bottom, and among sponges and polyzoans, at depths from 0–144 m (Stranks, 1988).

Etymology. The specific epithet *warringa* is derived from an Australian Aboriginal word meaning “the sea”, and is to be treated as indeclinable.

Remarks. There has been discussion about the generic placement of this species. *Octopus warringa* has been previously incorrectly identified and described under the name *Robsonella australis* (Hoyle, 1885).

Pickford (1955) reviewed the generic characters of *Robsonella*, and concluded that the genus was not valid. Pickford (1955) considered that species which had been assigned to *Robsonella* should be returned to the genus *Octopus*, a view I agree with.

Tait (1982) revised *Octopus australis* Hoyle, 1885 from south-eastern Australia, and discussed the status of similar species described from New Zealand, including material described as *Robsonella australis*. *Octopus warringa* may be readily distinguished from *O. australis* by the characteristic skin patterning (particularly the absence of a ventro-lateral integumentary ridge), the enlarged suckers on all arms of mature males and females, the bulbous-shaped ligula, and the small eggs arranged in festoons.

Previous accounts, under various names, now referable in part or entirely to *O. warringa* include: *Polypus duplex* (Hoyle, 1885) (as used by Berry, 1917); and *Robsonella australis* (Hoyle, 1885) (as used by Benham, 1942; Dell, 1952; 1959; Brough, 1965). Two detailed descriptions exist for *Octopus warringa* (Benham, 1942; Dell, 1952).

Berry (1917) described a specimen collected by the “Aurora” off Maria Island, Tasmania, during the Australasian Antarctic Expedition (1911–1914). Berry (1917) tentatively identified the specimen as *Polypus duplex*, and included measurements and a figure. The specimen was a mature female (AM C40887), not an immature female as Berry (1917) reported.

Based upon the examination of 30 new specimens from New Zealand, Benham (1942) gave a comprehensive description of *Robsonella australis*, with detailed measurements and figures.

Of this series in the Otago Museum, nine specimens have been re-examined.

Dell (1952) also described new material of *R. australis* from New Zealand, and in 1959 listed two specimens collected by the "Discovery" off Tasmania during the British, Australian and New Zealand Antarctic Research Expedition (BANZARE) (1929–1931). One specimen, a submature female (SAM D15219), has been re-examined; a second specimen, a male (SAM D15220) collected from fish stomach contents, has been examined but was unsuitable for measurement.

The systematic status of several lots of material described from New Zealand waters cannot be identified with certainty. These include *Octopus campbelli* Smith, 1902 and *Polypus australis* Massy, 1916. These accounts differ from descriptions of both *Octopus australis* from south-eastern Australia, and *O. warringa* from south-eastern Australia and New Zealand. *O. campbelli* Smith, 1902, from Campbell Island, New Zealand, which was subsequently redescribed by Robson (1929), possesses enlarged suckers, an unusual ligula with a long calamus, and 10 gill lamellae. *Polypus australis*, described by Massy (1916) from Spirits Bay, New Zealand, and subsequently redescribed by Robson (1929), possesses a stout ligula, 6–7 gill lamellae, and a characteristic colour pattern of spots and bars on the arms. Definite conclusions regarding the species' identities and affinities await examination of the respective materials.

Specimens of *Octopus warringa* from south-eastern Australia and New Zealand are almost exactly the same; no geographical variation was detected. *O. warringa* is a distinctive species endemic to temperate waters of south-eastern Australia and New Zealand. It can be distinguished easily from other species of *Octopus* on the basis of a combination of characters: a broadly ovoid mantle; skin with a characteristic pattern of rounded tubercles and both branched and unbranched papillae on the dorsum, and enlarged papillae over each eye; large and prominent eyes; long, subequal arms (1.9–3.7 times ML in mature animals); moderately sized suckers, enlarged on all arms of mature males and females; a medium sized ligula (6–10% of third right arm length in mature animals); small eggs (2–3 mm long), arranged in festoons; and 6–8 gill lamellae.

Brough (1965) described the morphology and brooding of eggs, and the hatching and behaviour of juveniles of *Robsonella australis*, here re-identified as *Octopus warringa*. A female

specimen in the Portobello Aquarium laid approximately 1000 eggs during January 1963, which she brooded for about 80 days, until hatching occurred (Brough, 1965). *O. warringa* has mature eggs with a small egg length index (7–13% of mantle length), and the newly hatched juveniles are small, with a total length of approximately 4 mm (Brough, 1965; and this study). Based upon the relative sizes of eggs and juveniles, it may be assumed that the juveniles of *O. warringa* adopt a planktonic existence initially. The duration of the planktonic phase is unknown.

Octopus kaurna sp. nov.

Figures 2a–f

Octopus flindersi.—Macpherson, 1966: 241, text-fig. 1, pl. 2, figs 1–3 (*partim*) (non *Octopus flindersi* Cotton, 1932).

Octopus Species B.—Stranks, 1988: 61, text figs 26–30.

Material examined. Holotype: Victoria, Hobsons Bay (37°52'S, 144°56'E), NMV F24494 (mature male, 34.0 mm ML).

Paratypes: Victoria, Port Phillip Bay, Rosebud (38°22'S, 144°54'E), shallows, J.H. Black, 5 Feb 1969, NMV F53228 (mature female, 42.3 mm ML); Port Phillip Bay, Carrum (38°05'S, 145°07'E), beached, Port Phillip Authority, Feb 1981, NMV F52317 (mature female, 51.0 mm ML).

South Australia, Brighton (35°01'S, 138°31'E), Sept 1937, SAM D13283 (immature male, 31.3 mm ML); Glenelg (34°58'S, 138°32'E), A. Robb, 29 Mar 1949, SAM D16195 (mature female, 60.9 mm ML); Great Australian Bight (32°24'S, 133°30'E), 49 m, FRV "Explorer", P. Symonds, 23 Aug 1973, NMV F53226 (mature male, 38.6 mm ML).

Other material: Victoria, Port Phillip Bay, Mordialloc (38°01'S, 145°05'E), W. Kershaw, Nov 1888, NMV F24488 (immature female, 22.7 mm ML); Port Phillip Bay, Mentone (38°00'S, 145°04'E), L. Kershaw, 28 May 1928, NMV F24505 (mature male, 57.2 mm ML).

Description. Medium-sized animals (ML to 85 mm; TL to 420 mm); mantle elongate ovoid (MWI 40.0–69.9–106.8); head wide, slightly narrower than mantle (HWI 36.7–58.1–88.8), demarked from mantle by minor constriction; eyes small, not projecting far above surface of head. Funnel large, slender, bluntly tapered (FuLI 43.9–61.4–88.8); funnel organ VV-shaped, limbs thick, outer limbs three-quarters as long as median limbs. Arms very long (MAI 14.5–23.1–33.3) (3.1–6.2 times ML in mature animals), slender, tapering to narrow tips. Arm lengths unequal, arm order I.II.III.IV. Arm suckers biserial, deeply set in arms, small sized

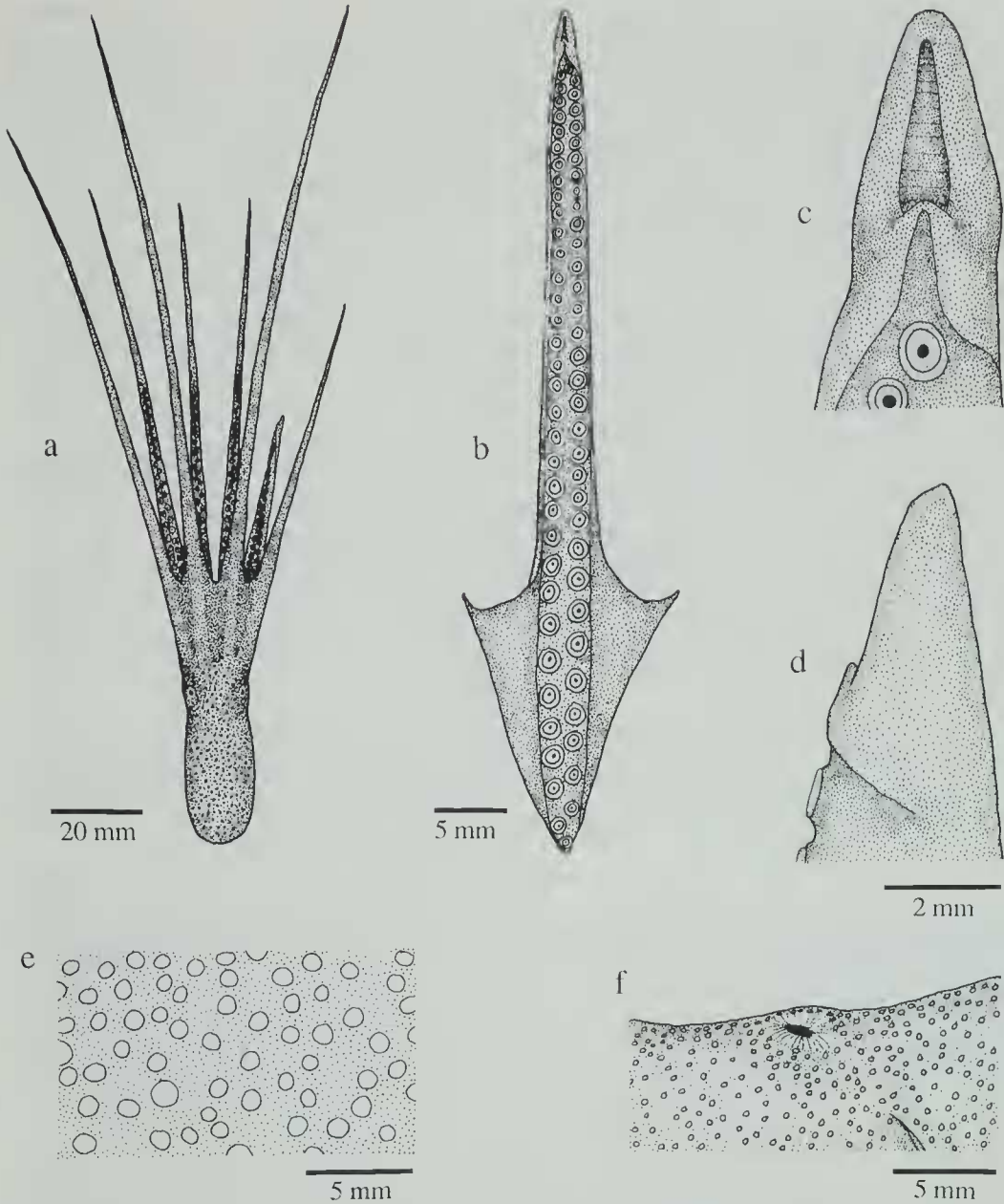


Figure 2. *Octopus kaurna* sp. nov.: a, dorsal view, and b, hectocotylied arm, of holotype, NMV F24494, 34.0 mm ML; c, dorsal, and d, lateral, detail of hectocotylus of NMV F24505, 57.2 mm ML; e, rounded tubercles on mantle dorsum of paratype, NMV F52317, female, 51.0 mm ML; f, lateral view of ocular region of NMV F24488, female, 22.7 mm ML.

(ASIn 3.0–5.3–8.7), all suckers similarly sized, without sucker enlargement. Third right arm of males hectocotylied, shorter than its opposite number (OAI 53.5–61.2–69.3; HcAI 143.5–248.9–325.5); ligula 4–8% of third right arm

length in mature animals (LLI 4.7–6.0–8.0); ligula groove long, well marked and moderately deep, with incomplete transverse ridges; calamus short, pointed (CaLI 32.7–41.7–48.0); hectocotylied arm with 66–129 suckers. Web very

shallow (WDI 10.5–14.1–18.7), web formula usually ABCDE. Radula with B₄₋₅ seriation of the rhaechidian. Ink sac present. Gill lamellae 9–11. Mature female with large eggs (9–11 mm long; 2–3 mm wide); method of egg attachment to substrate unknown. Male with long penis (PLI 17.7–23.9–35.5), with a large, single coiled diverticulum; spermatophores relatively short (SpLI 51.7–82.4–103.1), slender (SpWI 2.6–3.6–5.3), with large, coiled sperm reservoir (SpRI 20.5–28.7–39.3).

Integumental sculpture consists of a pattern of fine, rounded and widely set epidermal tubercles; tubercles reach the largest size on the dorsum, and those on the ventral surface are smaller and less prominent; some tubercles on ventro-lateral surface are more elongate, but no more prominent, than those on dorsal and ventral surfaces; no larger papillae in ocular region; lateral integumentary ridge or fold around mantle circumference absent. No information is available on colouring of live animals. Preserved animals in ethyl alcohol uniformly light brown to dark purple dorsally, creamy red to light brown ventrally. Ocelli absent.

Distribution. South-eastern Australia, from the Great Australian Bight to eastern Victoria, including Bass Strait and northern Tasmania. An inshore species, living on sand bottom, and among seagrass, at depths from 0–49 m (Stranks, 1988).

Etymology. The specific epithet *kaurna* is derived from the name of an Australian Aboriginal clan which originally inhabited the Adelaide region of South Australia, and is to be treated as indeclinable.

Remarks. Undescribed medium-sized octopuses, with elongate ovoid mantles and very long arms, from south-eastern Australia, were noted in museum collections. Macpherson (1966) had identified two (NMV F24488 and NMV F24505; an immature female and a mature male respectively) from Port Phillip Bay, Victoria, as *Octopus flindersi* Cotton, 1932. They are now re-identified as a new species, *O. kaurna*.

O. kaurna is a distinctive species endemic to temperate waters of south-eastern Australia. It can be distinguished easily from other species of *Octopus* on the basis of a combination of characters: an elongate ovoid mantle; skin with a characteristic pattern of rounded tubercles on the dorsum, without large papillae over the eyes; small, not prominent eyes; very long, unequal

arms (3.1–6.2 times ML in mature animals); small suckers, without enlargement; a small sized ligula (4–8% of third right arm length in mature animals); large eggs (9–11 mm long), with unknown method of attachment to substrate; and 9–11 gill lamellae.

The biology of the species is unknown.

Octopus bunurong sp. nov.

Figures 3a–f

Octopus flindersi.—Macpherson, 1966: 241, text fig. 1, pl. 2, figs 1–3 (*partim*) (non *Octopus flindersi* Cotton, 1932).

Octopus Species C.—Stranks, 1988: 65, text figs 31–35.

Material examined. Holotype: Victoria, Wilsons Promontory, Townsend Point (38°49'S, 140°16'E), beached, National Museum of Victoria, 13 Dec 1977, NMV F53223 (mature male, 55.0 mm ML).

Paratypes: Victoria, Western Port, Crib Point (38°21'S, 145°13'E), University of Melbourne, Department of Zoology, 25 Mar 1974, NMV F57445 (immature male, 37.5 mm ML); Corner Inlet, Yanakie, Red Bluff (38°49'S, 146°13'E), Marine Study Group, 24 Mar 1974, NMV F53221 (mature female, 45.5 mm ML).

South Australia, Marino Rocks (35°03'S, 138°31'E), R. Browne, 28 Jan 1982, SAM D17986 (mature male, 93.2 mm ML); Sir Joseph Banks Group, west of Partney Island, Partney Shoal (34°31'S, 136°15'E), 6 m, W. Zeidler and N. Holmes, 21 Jan 1986, SAM D17983 (mature male, 40.3 mm ML).

Other material: Victoria, Corio Bay, Geelong (38°10'S, 144°21'E), C. Burton, Feb 1903, NMV F5101 (immature male, 25.0 mm ML); Port Phillip Bay, Newport Power House (37°51'S, 144°54'E), H. Morrison, 25 Feb 1947, NMV F1516 (mature male, 49.2 mm ML); Western Port, French Island (38°20'S, 145°21'E), 1974, NMV F53222 (mature male, 37.5 mm ML); Western Port, Corinella (38°25'S, 145°26'E), Marine Study Group, 9 Feb 1969, NMV F53220 (mature male, 39.3 mm ML).

Description. Medium-sized animals (ML to 95 mm; TL to 475 mm); mantle elongate ovoid (MWI 42.3–59.0–83.2); head slightly narrower than mantle (HWI 27.7–49.0–65.3), demarked from mantle by moderate constriction; eyes large, projecting above surface of head. Funnel large, slender, bluntly tapered (FuLI 46.7–55.3–74.7); funnel organ VV-shaped, limbs thick, outer limbs three-quarters as long as median limbs. Arms very long (MAI 14.1–20.8–28.2) (4.1–7.3 times ML in mature animals), stout, tapering to narrow tips. Arm lengths unequal, arm order I.II.III.IV. Arm suckers biserial, raised from arm surface, moderately sized (ASIn 3.4–6.9–11.9), 15th to 25th suckers usually

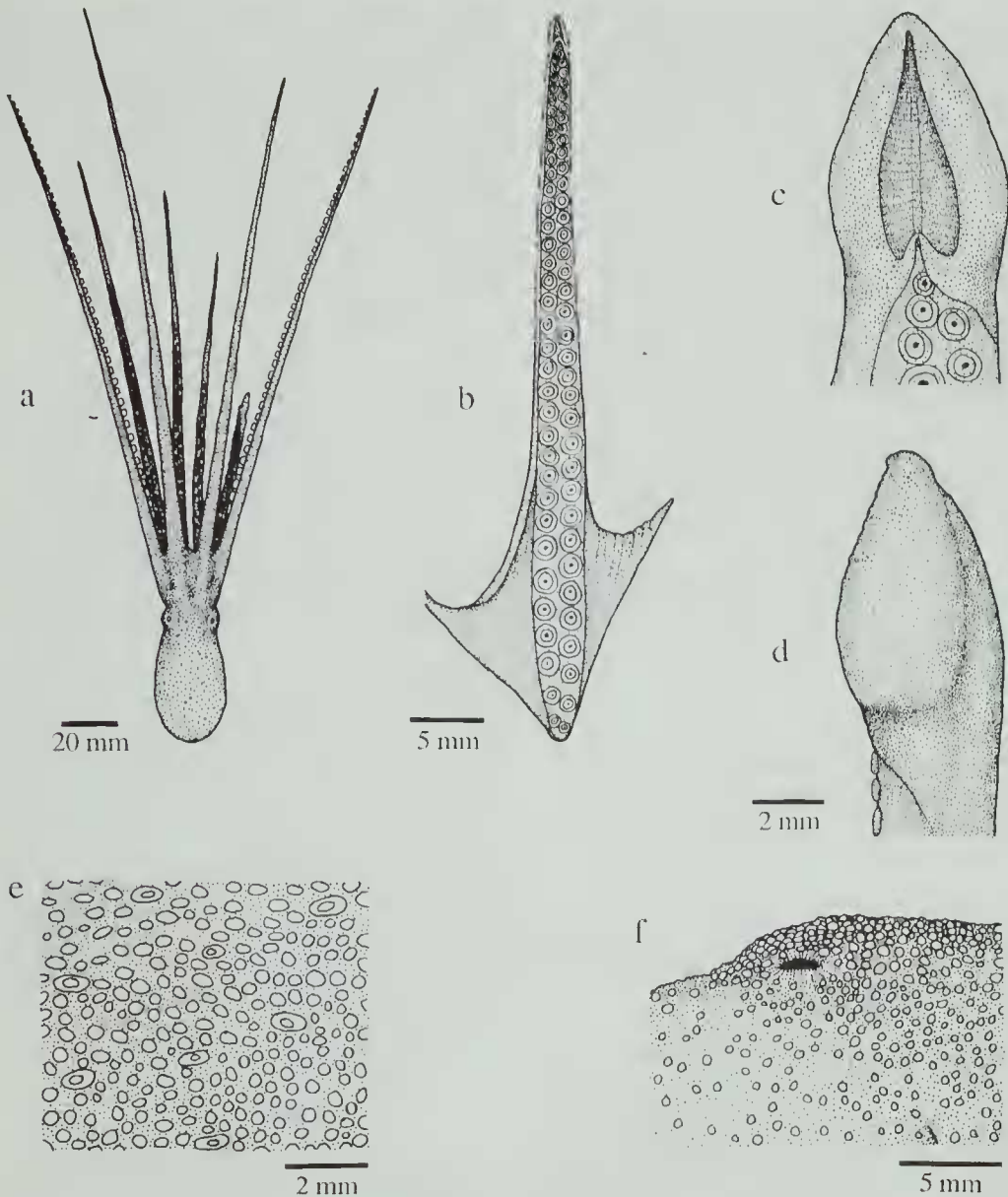


Figure 3. *Octopus bunurong* sp. nov.: a, dorsal view of holotype, NMV F53223, male, 55.0 mm ML; b, hectocotyliised arm of NMV F5101, 25.0 mm ML; c, dorsal, and d, lateral, detail of hectocotylus of NMV F53220, 39.3 mm ML; e, rounded and elongate tubercles on mantle dorsum of NMV F53220, male, 37.5 mm ML; f, lateral view of ocular region of NMV F53220, male, 39.3 mm ML.

largest, without sucker enlargement. Third right arm of males hectocotyliised, shorter than its opposite number (OAI 45.9–61.6–81.8; HcAI 166.9–208.6–278.9); ligula 9–12% of third right arm length in mature animals (LLI 9.0–9.8–11.8); ligula groove long, well marked and deep,

with incomplete transverse ridges; calamus very short, acutely pointed (CaLI 12.8–17.5–22.1); hectocotyliised arm with 70–96 suckers. Web very shallow (WDI 9.4–12.4–14.8), web formula usually ABCDE. Radula with Λ_{3-4} seriation of the rachidian. Ink sac present. Gill lamellae

9–10. Mature female with large eggs (8–10 mm long; 2–3 mm wide); method of egg attachment to substrate unknown. Male with long penis (PLI 4.5–20.7–39.2), with a single coiled diverticulum; spermatophores relatively short (SpLI 41.2–65.1–102.9), slender (SpWI 3.1–4.4–5.1), with large, coiled sperm reservoir (SpRI 40.6–49.7–55.9).

Integumental sculpture consists of a pattern of fine, rounded and closely set epidermal tubercles; some irregularly spaced tubercles are larger and more elongate than the former type; tubercles reach the largest size on the dorsum, and those on the ventral surface are smaller and less prominent; no larger papillae in ocular region; lateral integumentary ridge or fold around mantle circumference absent. No information is available on colouring of live animals. Preserved specimens in ethyl alcohol light brown to red brown dorsally, creamy red to light brown ventrally. Some regions on the dorsum have a mottled appearance. Surface of the raised tubercles usually darker than the background, coloured brick red to dark brown, giving a speckled appearance. Ocelli absent.

Distribution. South-eastern Australia, from the Great Australian Bight to southern New South Wales, including Bass Strait and northern Tasmania. An inshore species, living on reefs, or rocky areas of sand, and among seagrass, at depths from 1–130 m (Stranks, 1988).

Etymology. The specific name *bunurong* is derived from the name of the Australian Aboriginal clan which once inhabited the south-eastern region of Melbourne, Victoria, and is to be treated as indeclinable.

Remarks. *Octopus bunurong* is a new species of medium sized octopus with an elongate ovoid mantle and very long arms, from south-eastern Australia. Macpherson (1966) had identified two (NMV F5101 and NMV F1516; a juvenile male and a mature male respectively) from Port Phillip Bay, Victoria, as *O. flindersi*. The specimens are now re-identified as *O. bunurong*.

Octopus bunurong appears closely related to *O. kurna*, but may be readily distinguished from the latter by the characteristic skin patterning, the larger and more prominent eyes, the larger suckers on all arms, and the longer ligula.

O. bunurong is a distinctive species endemic to temperate waters of south-eastern Australia. It can be distinguished easily from other species of *Octopus* on the basis of a combination of char-

acters: an elongate ovoid mantle; skin with a characteristic pattern of rounded and elongate tubercles on the dorsum, without large papillae over the eyes; large and prominent eyes; very long, unequal arms (4.1–7.3 times ML in mature animals); moderately large suckers, without enlargement; a medium sized ligula (9–12% of third right arm length in mature animals); large eggs (8–10 mm long), with unknown method of attachment to substrate; and 9–10 gill lamellae.

The biology of the species is unknown.

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